

## CLAIMS

What is claimed is:

1. A spectroscopy system, comprising:
  - a source system for generating light to illuminate a sample;
  - 5 a tunable Fabry-Perot filter system for filtering the light generated by the source;
  - and
  - a detector system for detecting the light filtered by the tunable Fabry-Perot filter from the sample,
  - wherein at least two of the source system, tunable Fabry-Perot filter system, and the
  - 10 detector system are integrated together.
2. A spectroscopy system as claimed in claim 1, wherein the source system comprises a broadband source.
3. A spectroscopy system as claimed in claim 1, wherein the source system comprises multiple, multiplexed diode chips, operating at different wavelength ranges.
- 15 4. A spectroscopy system as claimed in claim 1, wherein the source system comprises at least one superluminescent light emitting diode (SLED) source.
5. A spectroscopy system as claimed in claim 1, wherein the tunable Fabry-Perot filter system comprises multiple, parallel filters.
6. A spectroscopy system as claimed in claim 1, wherein the tunable Fabry-Perot filter
- 20 system comprises multiple filters for filtering different wavelength ranges.
7. A spectroscopy system as claimed in claim 1, wherein the tunable Fabry-Perot filter system comprises multiple, serial filters.
8. A spectroscopy system as claimed in claim 1, wherein the tunable Fabry-Perot filter system comprises multiple, serial filters with different free spectral ranges.

9. A spectroscopy system as claimed in claim 1, wherein the detector system comprises multiple detectors responsive to different wavelength ranges.

10. A spectroscopy system as claimed in claim 1, wherein the source system and the Fabry-Perot filter system are integrated on a common bench, in a common package.

5 11. A spectroscopy system as claimed in claim 1, wherein the Fabry-Perot filter system and the detector system are integrated on a common bench, in a common package.

12. A spectroscopy system as claimed in claim 1, wherein the source system, Fabry-Perot filter system, and the detector system are integrated on a common bench, in a common package.

10 13. A spectroscopy system as claimed in claim 1, wherein the Fabry-Perot filter system comprises at least one MEMS tunable filter.

14. A spectroscopy system as claimed in claim 1, further comprising an isolation system between the source system and the tunable Fabry-Perot system for preventing backreflections in to the source system.

15 15. A tunable light source, comprising:  
a broadband source for generating broadband light; and  
a tunable Fabry Perot filter for spectrally filtering the broadband light from the  
broadband source to generate a tunable signal to irradiate a sample. .

20 16. A tunable light source as claimed in claim 15, wherein the broadband source comprises a light emitting diode.

17. A tunable light source as claimed in claim 15, wherein the broadband source comprises a superluminescent light emitting diode.

18. A tunable light source as claimed in claim 15, wherein the broadband source comprises an array of diodes.

19. A tunable light source as claimed in claim 15, wherein the broadband source and the Fabry Perot filter are installed in common on an optical bench.

20. A tunable light source as claimed in claim 15, comprising a tap for diverting a portion of the signal from the Fabry Perot tunable filter to a detector.

5 21. A tunable light source as claimed in claim 20, further comprising a stable spectral reference interposed between the detector and the tap.

22. A tunable source as claimed in claim 21, wherein the reference is a gas cell.

23. A tunable source as claimed in claim 21, wherein the reference is an etalon.

24. A tunable source as claimed in claim 15, further comprising:

10 a controller for modulating the broadband source; and  
a detector for detecting the tunable signal from the Fabry Perot filter; and  
a lock-in amplifier responsive to the controller for locking onto a modulation of the tunable signal.

25. A tunable source, comprising:

15 a broadband source for generating a broadband signal; and  
a tunable filter for generating a tunable narrow band signal from the broadband signal; and  
an isolator interposed between the broadband source and the tunable filter for preventing back reflections from the tunable filter into the broadband source.

20 26. A tunable source as claimed in claim 25, wherein a broadband source, isolator, and tunable filter are integrated on a common optical bench.

27. A tunable source as claim in claim 25, wherein the tunable filter is a Fabry Perot tunable filter.

28. A tunable source, comprising:

25 a broadband source for generating a broadband signal;

a tunable filter for spectrally filtering the broadband signal in order to generate a narrowband tunable signal; and  
an amplifier for amplifying the narrowband tunable signal.

5 29. A tunable source as claimed in claim 28, wherein the amplifier is a semiconductor optical amplifier.

30. A tunable signal as claimed in claim 28, wherein the amplifier is a fiber amplifier.

31. A tunable signal as claimed in claim 28, wherein the fiber amplifier is one of an erbium, ytterbium, thulium or Raman fiber amplifier.

10 32. A MEMS Fabry Perot filter comprising a MEMS tunable movable mirror die and a fixed mirror substrate, which is bonded to the MEMS mirror die, wherein the filter is edge bonded onto an optical bench.

33. A MEMS tunable filter as claimed in claim 32, wherein the fixed mirror substrate extends below a bottom of the MEMS mirror die for attachment to the optical bench

15 34. A MEMS tunable filter as claimed in claim 32, wherein the MEMS mirror die is separated from the optical bench and supported by the fixed mirror substrate.